Location:

Within the Operations and Checkout (O & C) Building
NASA Parkway, east of the Kennedy Space Center
Headquarters Building,
John F. Kennedy Space Center
Brevard County
Florida

U.S.G.S. Cape Canaveral 7.5' Quadrangle, Universal Transverse UTM Reference:
17.534600.3155100

Present Owner:

National Aeronautics and Space Administration (NASA)
Kennedy Space Center, FL 32899-0001

Present Use:

Aerospace facility

Significance:

The Operations and Checkout (O&C) Building is located in the Industrial Area of the John F. Kennedy Space Center (KSC) (Figure 1). Built in 1964, this five-story, 601,505 square foot (ft^2) structure contains offices, laboratories, astronaut quarters, and spacecraft assembly and testing areas. The O&C Building was listed in the National Register of Historic Places in 2000 in recognition of its exceptional importance at the national level in the context of the Apollo program. It is considered significant in the areas of space exploration, engineering and architecture.

The O&C Building was originally used to assemble and test the Apollo spacecraft before launching. In later years, the facility was modified to support the Space Shuttle Program. Mechanical and electrical experiment and payload integration are performed primarily in the High Bay and Low Bay areas of the O&C Building. The Low Bay is the main area for processing horizontally integrated payloads.

NASA has proposed demolition of facility elements located in the Low Bay area (Figure 2) incident to the Space Shuttle Transition. The focus of this documentation are those elements scheduled for removal: the Apollo Telescope Mount (ATM) Clean Room, Workstands 2 and 3, Cargo Integration Test Equipment (CITE) (Workstand 4), the Experiment Integration Test Stand (North Stand), as well as the Rack, Floor and Pallet Stand (Mideast Stand), that are

Historical Information

The Low Bay Area of the O&C Building was originally used for the assembly and testing of Gemini capsules and all of the Apollo Lunar and Command Service Modules (CSMs) (Photo 1). In the 1970s, the facility was used to integrate and test the Apollo-Soyuz and Skylab missions.

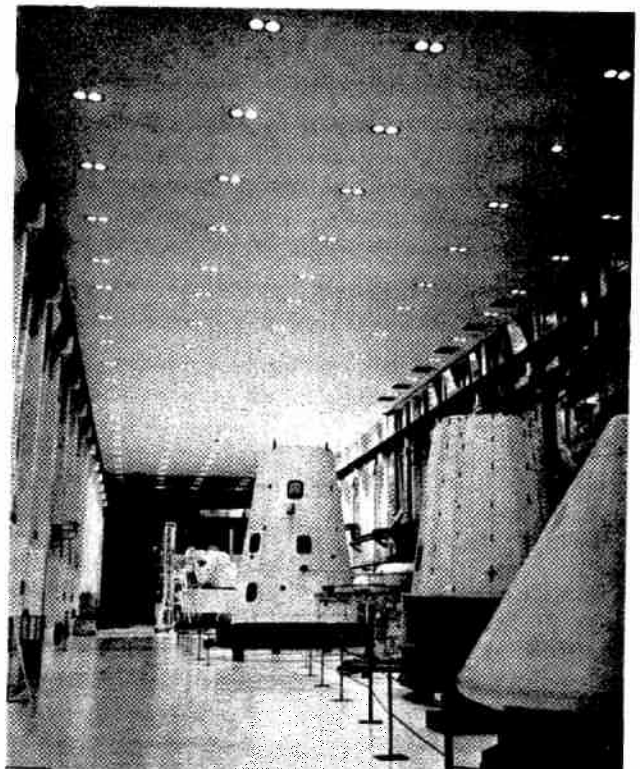

Photo 1. Low Bay area, March 1968 (Credit: NASA, Photo 116 KSC-68-2629).

Skylab

Skylab, the first space station, was a manned space observatory, designed to conduct solar research while orbiting the Earth. Skylab grew out of the Apollo Applications Program (AAP), which sought to make good use of Apollo launch vehicles and equipment. All three manned Skylab missions were launched in modified Apollo CSMs by Saturn IB vehicles.

The Skylab 1 (SL-1) spacecraft consisted of two launch vehicle stages (S-1C and SII), an instrument unit, and three major payload modules, including the Orbital Workshop (OWS), an airlock module/multiple docking adapter (AM/MDA), and the ATM, as well as the payload shroud, nose cone, and various experiments (Newkirk and Ertel 1977). The ATM (Photo 2), designed and constructed at NASA's Marshall Space Flight Center (MSFC), housed the first manned scientific telescope in space. The ATM consisted of three major sections: a 14-ft diameter sunshield, an instrument canister, and a spar assembly, which carried the instruments within the canister. There was also a set of four large solar cell arrays. The ATM included eight major scientific instruments and a number of smaller experiments (NASA 1999). Among these were two Naval Research Laboratory (NRL) ultraviolet instruments for photographing the sun and its spectra. Experiments captured data on film, and increased the understanding of the sun's character, including solar phenomenon known to exist on the sun's surface and atmosphere, which was inaccessible to telescopes on Earth.

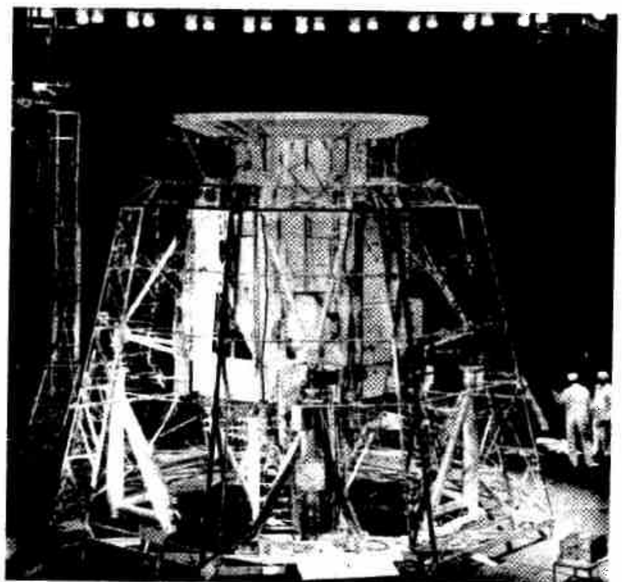

Photo 2. ATM Tested at the Manned Spacecraft Center (now Johnson Space Center [JSC]), August 1, 1971. (Credit: NASA-MSFC, Photo ID: MSFC -7022294)

The ATM required control of cleanliness, temperature and humidity during manufacture, quality checkout, and flight checkout operations. To meet these needs, two buildings at MSFC were used for manufacture and quality checkout. The Low Bay area of the O&C Building was selected for flight checkout (Wade 2005). In early 1972, both the ATM flight unit and the prototype (which became the backup flight unit) underwent a three-month post-manufacturing checkout at MSFC, which included vibration, thermal and vacuum tests (Wade 2005).

The ATM and the OWS arrived at the KSC from the MSFC on September 22, 1972 aboard a Guppy aircraft. Upon arrival, the ATM was transported to the clean room in the O&C Building where it underwent intensive checkout, and was then moved to the Vehicle Assembly Building (VAB). The AM/MDA arrived on October 6, 1972 and was taken to the O&C Building for docking tests with the SL-2 CSM. After testing, the components including the AM/MDA, fixed airlock shroud, docking adapter, and payload shroud were flight-mated, then moved to the VAB and mated to the OWS. (Newkirk and Ertel 1977; Wade 2005).

SL-1, the unmanned Orbital Workshop, launched on a Saturn V vehicle from Launch Complex (LC) 39 Pad A at 1:30 PM EST on May 14, 1973. The ATM with its solar array (Photo 3) deployed as planned during the first orbit. However, deployment of the workshop solar array and the meteoroid shield were not successful, resulting in a delayed flight for the manned Skylab 2 (SL-2).

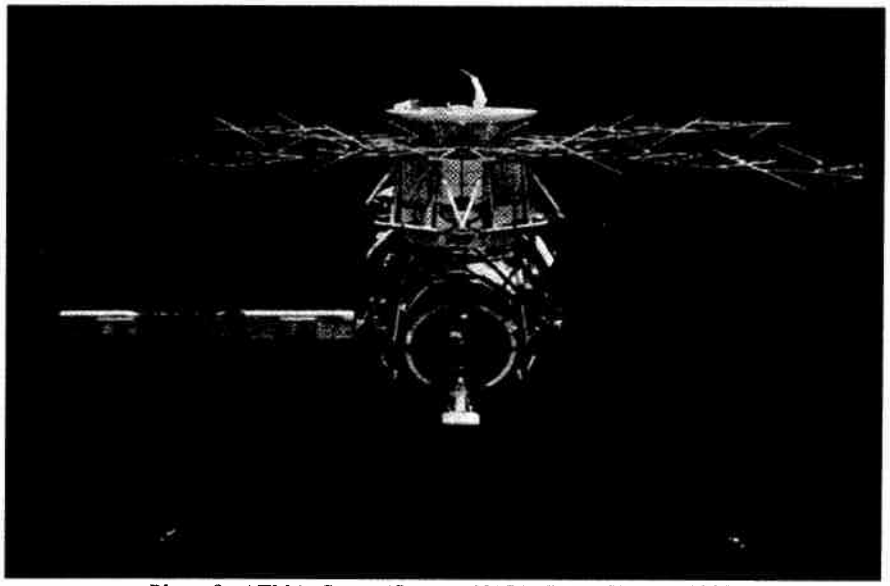

Photo 3. ATM in Space (Source: NASA Space History 1999)

Systems testing of the CSM for the manned Skylab 2 (SL-2) was conducted in July 1972. SL-2 was launched on May 25, 1973 from LC 39 Pad B atop a smaller Saturn IB vehicle. It carried a crew of three astronauts to rendezvous with the OWS: Charles "Pete" Conrad, Jr., Joseph P. Kerwin, and Paul J. Weitz. The SL-2 mission ended with splashdown in the Pacific Ocean on June 22. Mission accomplishments included 82 hours of manned viewing time and 154 hours of ground commanded data gathering. The SL-2 crew is notable as the first in history to perform major repairs in space.

The CSM for the Skylab 3 (SL-3) mission arrived at the KSC's O&C Building on December 1, 1972 for systems testing. The July 28, 1973 launch, using a Saturn IB vehicle, was manned by astronauts Alan L. Bean, Owen K. Garriott, and Jack R. Lousma. Splashdown was September 25, 1973. SL-3, like the mission which followed, carried replacement subsystems and new components. The final Skylab mission, SL-4, began in February 1973 with systems testing in the O&C Building. The vehicle, which carried crew members Gerald P. Carr, Edward G. Gibson, and William R. Pogue, launched from LC 39 Pad B on November 16, 1973 and splashed down in the Pacific Ocean on February 8, 1974. Operational use of Skylab, the first American space station, ended with this mission. Based upon calculations made during this mission, the orbiting workshop was estimated to remain in orbit for about nine years before reentering the Earth's atmosphere. This event was predicted to occur sometime in March 1983. However, with the coming Space Shuttle program, NASA envisioned that the falling Skylab could be boosted into a higher orbit by the Space Shuttle to permit its continued use (Jenkins 2002:235). Due to delays in initiating the first Space Shuttle flight, this plan was cancelled. As a result, on July 11, 1979, the Skylab OWS disintegrated when it re-entered the earth's atmosphere. The debris rained down over an area stretching from the south-east Indian Ocean into Western Australia (Heppenheimer 2002:67; Wade 2005).

Overall, the Skylab program demonstrated NASA's capability to conduct longer manned missions. It also marked the first successive attempt to resupply space vehicles, and served to obtain medical data on the crew for use in extending the duration of manned space flights (Newkirk and Ertel 1977). The objectives in using the ATM were also successfully met. Operated for a total time of 519 hours by the mission crews, the ATM obtained coverage of the comet Kohoutek, a solar eclipse, and two solar flares, among other significant accomplishments (Newkirk and Ertel 1977). A backup ATM at MSFC was disassembled in 1982 and transferred to the Smithsonian National Air and Space Museum, where it was displayed until October 1997 (NASA 1999).

Spacelab

On September 24, 1973, the European Space Agency (ESA) and NASA signed a memorandum of understanding, agreeing to design and develop Spacelab. The decision to develop Spacelab "resulted almost entirely from West Germany's strong desire to get involved in manned space flight, and its willingness to finance 52 percent of Spacelab's costs" (Jenkins 2002:101). Spacelab was a manned, reusable, microgravity laboratory flown into space in the rear of the Space Shuttle cargo bay. It was developed on a modular basis allowing assembly in a dozen arrangements depending on the specific mission requirements (NASA 1988). Spacelab was the primary horizontally-processed Space Shuttle payload.

The four principal components of the Spacelab design are a pressurized module containing a laboratory, one or more open pallets that expose materials and equipment to the space environment, a tunnel which provides access to the module from the crew compartment, and an instrument pointing system (NASA 1988). Experiments were conducted in the pressurized module, or outside, with instruments mounted on pallets exposed to space. The pressurized module consisted of two segments: a core containing support systems, and an experiment segment providing work space. The U-shaped pallets were "designed for large instruments, experiments requiring direct exposure to space or systems needing unobstructed or broad fields of view" (NASA 1988). Up to five pallets could be linked to form a "pallet train."

MSFC was responsible for Spacelab development and missions, as well as payload control during missions. Actual construction of the Spacelab pressurized modules was started by ERNO-VFW Fokker in 1974. The first lab, LM1, was donated to NASA in exchange for flight opportunities for European astronauts. Later, NASA purchased LM2, the second lab. The first Spacelab mission, carried aboard Columbia (STS-9), began on November 28, 1983 and lasted until December 8, 1983. During this mission, which was called "science around the world and around the clock," the crew of six divided into two three-man shifts and worked almost continuously for 10 days. Their accomplishments included growing the first protein crystals in space, scanning the chemical makeup of the atmosphere, measuring radiation from the sun, and experimenting with the behavior of fluids (NASA 1999).

In contrast to the first Spacelab mission, which focused on demonstrating its usefulness in all scientific disciplines, the following two Spacelab missions were dedicated to specific disciplines.

Spacelab 3, launched in March 1985, carried an array of materials science experiments and atmospheric instruments; Spacelab 2, flown in July 1985, carried instruments to study the sun, stars, and cosmic rays. A total of five Spacelab missions were flown between 1983 and 1985. Following a hiatus in the aftermath of the Challenger disaster, the next Spacelab mission was not launched until 1990. In this year, STS-35 carried ASTRO-1, an ultraviolet telescope.

In total, 28 Space Shuttle missions carried Spacelab hardware before the program was decommissioned in 1998 (NASA 1999). Of these missions, 15 used the Spacelab long module, and eight used trains of two or three pallets to carry telescopes and other instruments. The remaining five are not counted as true Spacelab missions since they used modified pallets (NASA 1999). In addition to astronomical, atmospheric, microgravity, and life sciences missions, Spacelab was also used as a supply carrier with pallets carrying replacement parts to the Hubble Space Telescope and supplies for the Mir space station. STS-90, launched in April 1998 aboard Columbia, was the last mission to carry a Spacelab module. Known as Neurolab, it carried life-science experiments that sought to study the behavior of nervous systems in zero-g (Heppenheimer 2002b:48). In 1998, the Spacelab program was retired since the experiments conducted on it could now be performed on the International Space Station (ISS).

Physical Description

The Low Bay area of the O&C Building measures 475' long, 86' wide, and 70' high, with a net area of 41,275 ft^2. The ATM Clean Room is located at the west end, and two 17 ½ –ton bridge cranes travel the length of both the Low and High Bay areas (NASA 1974:9-25). Beginning in 1976, substantial structural modifications were made to accommodate the pallet-type payloads in support of the Space Shuttle program. In August 1977, NASA contracted with W&J Construction Corporation of Florida to convert the bay area of the O&C Building into the Horizontal Processing Facility in support of Spacelab (Photos 4 and 5). Installation and modification of new integration and equipment stands took 300 days. In October 1977, the IBM Corporation was selected to develop the CITE, which was completed in July 1978.

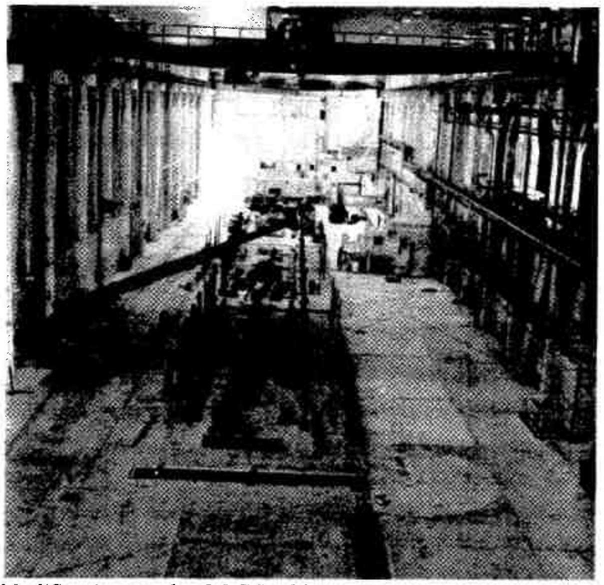

Photo 4. Modifications to the O&C Building in support of the Spacelab program
(Source: NASA, Photo KSC-378-0107, January 18, 1978)

Photo 5. Modifications to the O&C Building in support of the Spacelab program
(Source: NASA, Photo KSC-378C-0360, May 31, 1978)

The major facility elements constructed to support the Spacelab program (Photo 6) included two integrated assembly and checkout workstands (Workstands 2 and 3); two experiment integration workstands (North and South stands); the CITE stand; the rack, floor, and pallet stand (Mideast stand); the end cone stand area; the tunnel maintenance area; and staging and assembly areas (NASA 1994; Figure 2). Mechanical and ground support equipment (GSE) and services are located in and around the workstands.

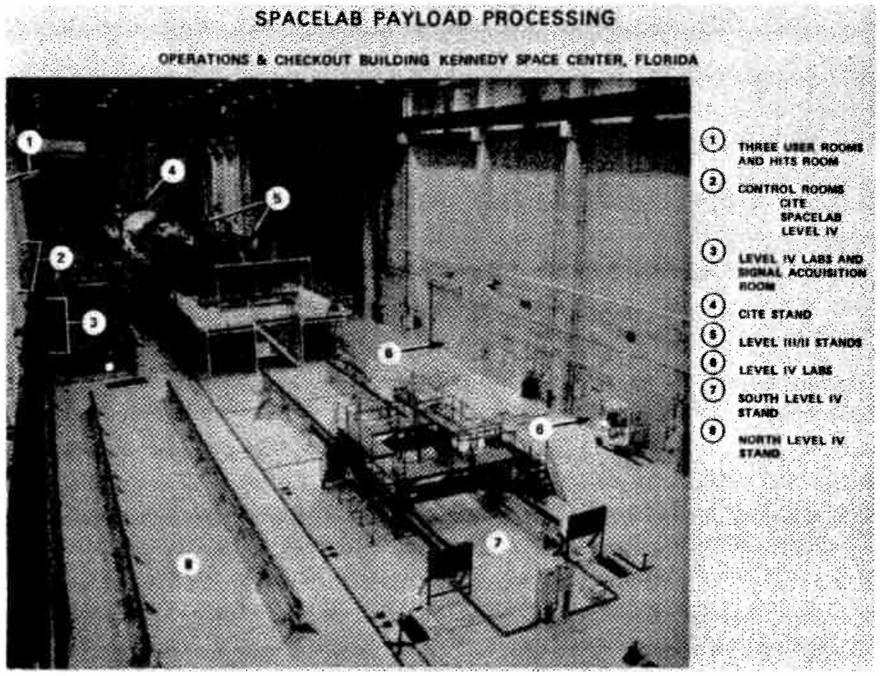

Photo 6. O&C Low Bay Area, April 28, 1981 (Credit: NASA, Photo 108-KSC-81PC-474).

ATM Clean Room

The Class 100,000 ATM Clean Room is a four-story structure located at the west end of the Low Bay area. The 2360 ft^2 net area (NASA 1974) was built ca. 1972 in order to provide a controlled environment to process and checkout the Apollo Telescope Mount. The clean room is divided into two sections: the clean room itself and its accompanying mechanical room. The exterior of this steel frame structure is clad with laminated panels on the ground level, working level, and personal access areas. Sound absorbing wall panels are used for the mechanical equipment areas.

The east (front) elevation of the clean room features the main points of access. At ground level, on the left side, there is a pair of paneled doors, approximately 10’ wide and 9’ high. A second pair of paneled doors, approximately 10’ wide and 7’ high, sits directly above at the working level. Also at the working level, on the right side, is a one-light metal door. Near the center, at working level, is a large pair of paneled doors, measuring approximately 20’ wide and 24’ high. These doors allow the ceiling-suspended crane to access to the clean room (Figure 3). A small “pass through” window is located near the bottom right corner of the right side door while the left side door contains a fixed glass window at the bottom left corner. A crane access opening is situated above the center of these doors. A two-level metal deck extends across most of the width of this elevation and provides access to the working level of the clean room, the personnel access room, and the first level of the mechanical room.

The south elevation features a one-light metal swing door on the ground level, but is otherwise void of openings. A large metal duct is situated near the southeast corner and extends the entire height of the structure. The west elevation, which lies approximately 5’ from the west wall and exterior door of the O & C Building, contains a one-light, metal swing door near the center at the working level. It is accessed via a metal staircase. This elevation also supports several air conditioning ducts and ventilation grills. The north elevation sits approximately 3' from the mechanical room. It contains openings for air ducts at ground level and at the third level.

The ATM clean room consists of two levels: the ground floor and the working level. The ground floor contains two main spaces. The first is accessed by the double doors on the clean room's east elevation. This room holds a 12'-5" by 13'-2" seismic pad, situated beneath the ATM mount opening. On the west wall of this space, is a second set of double doors, which lead into a large hallway. This hall can also be accessed through the door on the clean room's south elevation. To the north, the hall opens into a 20'-8" by 14'-11" ante room, which provides an airlock entry area for items brought into the clean room (NASA 1994).

The working level consists of one large room, which measures 36'-8" by 36'-10" and rises to a height of approximately 27'-6". There is an opening in the floor, towards the southeast corner, that was originally used for the placement of the ATM. The size and configuration of the ATM mount opening can be altered by adding or removing selected 2' by 2' porous aluminum floor panels (Sanders and Thomas 1971; NASA 1994). The opening also has removable metal handrails around its perimeter. A 4.5 metric ton bridge crane is attached to the ceiling of this room and is capable of crossing the room to within four feet of the walls. Movable panels in both the east top wall and ceiling open to accommodate the crane. The approximately 8' high plenum space above the working room ceiling contains the multiple air ducts required for its operation.

Near the northeast corner, a one-light metal swing door leads into an air shower, which connects the clean room to the personnel locker room. Employees were required to pass through the air shower, which measures approximately 3' by 5', before entering into the clean room. The north and south walls are defined by matching one-light, metal swing doors, while the east and west walls contain multiple circular air ducts that provide the "shower". A metal grate serves as the floor. The personnel access room wraps around the air shower along its east, north and west walls. This U-shaped room is lined with two vertical rows of lockers along the north and south walls, as well as the walls shared with the air shower.

The sole function of the ATM clean room was to support the Skylab program. Thus, the space is no longer in active use, and all working parts have been removed.

Mechanical Room

The mechanical room is located to the north of the ATM clean room, and sits approximately 14' above the Low Bay floor level. The east elevation of the mechanical room features a metal stairway. The stairway connects to the second level of the clean room's deck, just to the right of the air shower, and continues up to the third level of the mechanical room, where an additional ladder leads to the roof. Openings include a metal swing door with a fixed-light on the first level, three metal doors on the second level, and one metal door on the third level. The north elevation is void of any openings, but does contain a noise shield air intake louver to the left at the first level. The west elevation is also void of openings. It, however, has an exhaust grille to the left at the first level and an air conditioning duct, which connects to those on the west elevation of the clean room. The north elevation of the mechanical room contains openings at the first, second and third levels for air conditioning supply and return ducts.

The interior of the mechanical room contains three levels. The first level is the main control area, with the flow meter station, the ATC control panel, and the motor control center. It also contains the dehumidifier, two centrifugal air pumps and the main water pumps for the clean room. The second level is essentially an air tight plenum, serving as a large air filter and sound trap. It also contains the cooling and reheat coils for the HVAC system. To the south, spanning the width of this room, there is an opening in the ceiling, continuing the air tight plenum to the third level where three vane axial fans distribute the air to the ducts in the clean room.

Experiment Integration Stand (North Stand)
The North Experiment Integration Stand is located to the east of the ATM Clean Room along the north wall of the Low Bay (Figure 2). It measures approximately 92' long by 14' wide, with approximately 530 ft^2 of raised floor near the center of the rails which allows for the routing of utilities to the payload. The North Stand, also referred to as "North Rails," served as support for pallets, pallet segments, special structures or flight carriers, racks, and floors during experiment integration and in the early stages of assembly and testing (NASA 1994:3-10). In addition, it was capable of being fitted with portable access platforms, an Aft Flight Deck (AFD) simulator, a subsystem floor and rack simulator, and trunnion support and handling fixtures as needed. A second original Experiment Integration Stand (the South Stand), originally located directly to the south, is no longer extant.

Rack, Floor, and Pallet Stand (Mideast Stand)
The Rack, Floor, and Pallet Stand, also called the Mideast Stand, is situated along the north wall of the Low Bay, adjacent to Workstands 2 and 3 (Figure 2). It is 13'-10" wide and 109'- 7.5" long and contains rails which are directly mounted to the floor. Electrical power is available from six pedestal-mounted receptacles, three on each side of the rails. Panel "E," located at the northwest end of the stand, provides compressed air and gases (NASA 1994:3-35). This stand can accommodate electrical rack buildups that house the payload experiments, as well as pallets on the integration trolley (NASA 1994:3-35). It is capable of using the pallet access platform from Workstands 2 and 3, as well as the overhead bridge and the tunnel hatch access platforms. The payload, itself, is accessible from the floor and the various platforms. In addition, when attached to the stands, the module access and the pallet platform provide access to the payload.

Workstands 2 and 3

Workstands 2 and 3 are located near the center of the Low Bay area (Figure 2). Constructed in 1978, these nearly-identical raised, steel workstands (Figure 4) were designed to accommodate the buildup of Spacelab elements into a payload (NASA 1994). In addition to providing movable left- and right-hand longeron fittings and load monitoring capability, the stands are compatible with the Ground Support Equipment (GSE) provided by the European Space Agency (ESA).

Both workstands measure approximately 33' wide by 82' long, with a working deck set 10'-10" above the finished floor level of the Low Bay. The working deck features a 6' wide "walkway" on the north and south and a 12' wide "walkway" on the west, all of which provide access to the payload. A metal handrail extends around the exterior perimeter of the deck, while a removable post and chain system extends along the interior of the north and south portions. The west end of each workstand includes a stair case to the working deck, as well as an ionization detector support structure (NASA 1984).

The east end of each stand is open to accommodate additional moveable, working platforms (NASA 1982). These access platforms include a mid-body access platform, an overhead bridge access, and a payload access platform. All of these rail-mounted platforms are designed to be located in any Xo position within the workstands. However, none of the access platforms was in place at the time of documentation.

Fixed rails, placed four feet above the ground level, are located along the north and south sides within the interior of Workstands 2 and 3. These rails hold and move payloads in and out of the cargo bay. Each rail is fitted with six trunnion support assemblies, which are movable along the Xo axis and have adjustment capabilities along the Yo and Zo axes. The area below the working deck of each workstand is used largely for access to mechanical equipment. To the northeast corner, each has a 20' work area dedicated to payload Instrument Ground Support Equipment (IGSE).

Unique to Workstand 3 is a Jib Crane Hoist, located at the upper southwest corner (Figure 5). Used for raising and lowering loads between the ground and working levels, this 1-ton capacity jib rises 10' above the working deck and has a boom rail length of 10'. The device is capable of 12 different position lock points, located 30 degrees apart.

CITE Workstand 4

The Cargo Integration Test Equipment (CITE) Workstand 4 is located at the eastern end of the Low Bay (Figure 2). Constructed in 1978, it supports horizontal interface testing for the Space Shuttle program, and is the only stand of its type capable of performing Payload Operations Control Center interface testing outside of the orbiter (Nguyen 1995). CITE Workstand 4 is used solely for processing horizontal payloads which are typically related to Spacelab (NASA 1996). The CITE system verifies electrical and mechanical compatibility with the orbiter, as well as identifies and helps to resolve anomalies related to the cargo/shuttle interface (NASA 1996).

Similar to Workstands 2 and 3, the raised, steel CITE Workstand measures approximately 33' wide and 82' long, with a working deck set 10'-10" above the finished floor of the Low Bay (NASA 1982). Unlike the other two stands, the deck wraps entirely around the stand, with a metal handrail around the perimeter. A metal staircase is located in the center of the west end to provide access to the working deck.

The actual CITE equipment sits beneath the working deck at the west end of the workstand. This includes a wideband terminal distribution, an interface terminal distributor, some DC power supplies and distribution, an AC power distribution, an RF test set and the GES interface distribution. Also at the west end, raised slightly above the working deck, is the Aft Flight Deck (AFD) structure (Figure 5). The AFD is used to conduct detailed mission simulations and to practice new or unique payload configurations (Nguyen 1995). In addition, an On-Orbit Station (OOS) console frame, a Mission Specialist Station (MSS) frame, a Payload Specialist Station (PSS) frame, and a forward bulkhead simulator are located at this end of the working deck (Figure 5).

The middle section of the CITE Workstation 4 consists mainly of the payload bay, which measures approximately 7'-4" deep, 60' long and 16'-4" wide (NASA 1982). Movable payload support fittings, used to accommodate the payload trunnions, are situated on the longeron beams along the north and south edges of the bay opening. At the east end of the payload opening is the payload bay cable tray, which supports the payload being tested. Additional orbiter-like features including the aft bulkhead, orbiter simulated cable trays and fluid lines are also located at the east end. Openings are provided throughout the workstand to simulate Orbiter access hatches (NASA 1994).

The area below the working deck of the CITE Workstand 4 is used largely for access to mechanical and electrical equipment. The west end of the workstand contains the facility power access, the ground support cooling unit, an Operational Intercommunication System station, and AC/DC power distribution racks, which continue into the central section. Also within the center of the workstand are the Orbiter Midbody Umbilical Unit (OMBUU) simulator and Midbody umbilical panel access, and the heat exchange simulator. Between the center and the east end are spaces for mission specific equipment. Finally, the payload Ground Support Equipment (GSE) distributor sits within the east end of the lower level of the CITE Workstand 4 (Figure 5).

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NASA-OPERATIONS AND CHECKOUT BUILDING-LOW BAY
John F. Kennedy Space Center
Brevard County
Florida

Penny Rogo Bailes, Photographer
Teresa Norman, Assistant Photographer
(8BR1693-1 through 8BR1693-53)

April 2006

Penny Rogo Bailes, Photographer
(8BR1693-54 through 8BR1693-64)

May 2006

Note: Photograph Nos. 8BR1693-1 through 8BR1693-64 are 8" x 10" enlargements from 4" x 5" negatives.

8BR1693-1 OVERALL VIEW OF OPERATIONS AND CHECKOUT BUILDING- LOW BAY, FACING SOUTHEAST.

8BR1693-2 OVERALL VIEW OF OPERATIONS AND CHECKOUT BUILDING-LOW BAY, FACING SOUTHWEST.

8BR1693-3 VIEW OF ATM CLEAN ROOM, FACING NORTHWEST.

8BR1693-4 VIEW OF ATM CLEAN ROOM, FACING WEST.

8BR1693-5 VIEW OF EXTERIOR METAL DECK OF ATM CLEAN ROOM, FACING NORTH.

8BR1693-6 VIEW OF EXTERIOR METAL DECK OF ATM CLEAN ROOM, FACING NORTHWEST.

8BR1693-7 DETAIL OF GROUND LEVEL DOOR, ATM CLEAN ROOM, FACING NORTHWEST.

8BR1693-8 VIEW OF SEISMIC PAD CHAMBER, GROUND FLOOR, ATM CLEAN ROOM, FACING WEST.

8BR1693-9 VIEW OF AIRLOCK ENTRY AREA, GROUND FLOOR, ATM CLEAN ROOM, FACING NORTHEAST.

8BR1693-10 VIEW OF LOADING BAY (FOREGROUND) AND LOADING BAY DOORS (BACKGROUND), WORKING LEVEL, ATM CLEAN ROOM, FACING SOUTHEAST.

8BR1693-11 VIEW OF LOADING BAY CRANE, WORKING LEVEL, ATM CLEAN ROOM, FACING NORTHWEST.

8BR1693-12 DETAIL VIEW OF AIR SHOWER (FOREGROUND) AND PERSONEL LOCKERROOM (BACKGROUND), WORKING LEVEL, THE ATM CLEAN ROOM, FACING NORTH.

8BR1693-13 VIEW OF PERSONEL LOCKER ROOM, WORKING LEVEL, ATM CLEAN ROOM, FACING WEST.

8BR1693-14 VIEW OF MECHANICAL ROOM FOR ATM CLEAN ROOM, FACING NORTHWEST.

8BR1693-15 VIEW OF GROUND FLOOR EXTERIOR ELECTRICAL EQUIPMENT FOR THE ATM CLEAN ROOM, UNDERNEATH MECHANICAL ROOM, FACING SOUTHEAST.

8BR1693-16 VIEW OF ATM CLEAN ROOM (LEFT), EXPERIMENT INTEGRATION STANDS SOUTH STAND NO. 1 (CENTER) AND NORTH STAND NO. 1A (RIGHT), FACING NORTHWEST.

8BR1693-17 OVERALL VIEW OF EXPERIMENT INTEGRATION STANDS SOUTH STAND NO. 1 (CENTER) AND NORTH STAND NO. 1A (RIGHT), FACING NORTH.

8BR1693-18 VIEW OF CONTROL PANEL AND EXPERIMENT INTEGRATION STANDS SOUTH STAND NO. 1, FACING WEST.

8BR1693-19 DETAIL OF CONTROL PANEL FOR EXPERIMENT INTEGRATION STANDS SOUTH STAND NO. 1, FACING WEST.

8BR1693-20 VIEW OF EXPERIMENT INTEGRATION STANDS NORTH STAND NO. 1A AND ASSEMBLY UNIT, FACING WEST.

8BR1693-21 DETAIL VIEW OF EXPERIMENT INTEGRATION STANDS NORTH STAND NO. 1A, FACING NORTHEAST.

8BR1693-22 VIEW OF EXPERIMENT INTEGRATION STANDS NORTH STAND NO. 1A (CENTER) AND ASSEMBLY UNIT (LEFT), FACING NORTH.

8BR1693-23 DETAIL VIEW SERVICE PANEL "A" FOR EXPERIMENT INTEGRATION STANDS NORTH STAND NO. 1A, FACING WEST.

8BR1693-24 DETAIL VIEW OF SERVICE PANEL "E" FOR EXPERIMENT INTEGRATION STANDS NORTH STAND NO. 1A, FACING WEST.

8BR1693-25 VIEW OF RACK, FLOOR AND PALLET STAND (MID-EAST STAND) AND ASSEMBLY UNIT, FACING WEST.

8BR1693-26 VIEW OF RACK, FLOOR AND PALLET STAND (MID-EAST STAND) AND ASSEMBLY UNIT, FACING NORTHWEST.

8BR1693-27 VIEW OF WORKSTAND 2, FACING EAST.

8BR1693-28 VIEW OF WORKSTAND 2, FACING SOUTHEAST.

8BR1693-29 VIEW OF WORKSTAND 2, FACING NORTHEAST.

8BR1693-30 VIEW OF WORKSTAND 2, FACING NORTHWEST.

8BR1693-31 OVERALL VIEW OF UPPER LEVEL OF WORKSTAND 2, FACING WEST.

8BR1693-32 OVERALL VIEW OF LOWER LEVEL OF WORKSTAND 2, FACING WEST.

8BR1693-33 DETAIL VIEW OF LOWER LEVEL RAILS OF WORKSTAND 2, FACING WEST.

8BR1693-34 DETAIL VIEW OF POWER SUPPLY IN LOWER LEVEL OF WORKSTAND 2, FACING EAST.

8BR1693-35 DETAIL VIEW OF SERVICE PANEL "A" IN LOWER LEVEL OF WORKSTAND 2, FACING EAST.

8BR1693-36 DETAIL VIEW OF SERVICE PANEL "C" IN LOWER LEVEL OF WORKSTAND 2, FACING WEST.

8BR1693-37 OVERALL VIEW OF WORKSTAND 3, FACING NORTHEAST.

8BR1693-38 OVERALL VIEW OF WORKSTAND 3, FACING SOUTHWEST.

8BR1693-39 VIEW OF WORKSTAND 3, FACING SOUTHEAST.

8BR1693-40 DETAIL VIEW OF LOWER LEVEL, INTERIOR, WORKSTAND 3, FACING EAST.

8BR1693-41 OVERALL VIEW OF LOWER LEVEL OF WORKSTAND 3, FACING EAST.

8BR1693-42 VIEW OF UPPER LEVEL OF WORKSTAND 3, FACING NORTHEAST.

8BR1693-43 DETAIL VIEW OF UPPER LEVEL AND ATM SUPPORTS ON WORKSTAND 3, FACING SOUTHWEST.

8BR1693-44 OVERALL VIEW OF CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING SOUTHWEST.

8BR1693-45 OVERALL VIEW OF CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING SOUTHEAST.

8BR1693-46 OVERALL VIEW OF CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING NORTHWEST.

8BR1693-47 OVERALL VIEW OF CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING NORTHEAST.

8BR1693-48 OVERALL VIEW OF LOWER LEVEL OF CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING SOUTH.

8BR1693-49 DETAIL VIEW OF LOWER LEVEL, EXTERIOR, CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING WEST.

8BR1693-50 DETAIL OF ATM SUPPORTS ON LOWER LEVEL, EXTERIOR, CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING WEST.

8BR1693-51 OVERALL VIEW OF UPPER LEVEL OF CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING NORTHEAST.

8BR1693-52 OVERALL VIEW OF INTERIOR OF CARGO INTEGRATION TEST EQUIPMENT, (WORKSTAND 4), FACING WEST.

8BR1693-53 DETAIL VIEW OF LOWER LEVEL, INTERIOR, CARGO INTEGRATION TEST EQUIPMENT (WORKSTAND 4), FACING EAST.

Photograph Nos. 8BR1693-57 through 8BR1693-68 are photocopies of engineering drawings. Original drawings are located at the Design Engineering Office, NASA, Florida.

8BR1693-54 Photocopy of drawing
OPERATIONS & CHECKOUT BUILDING ASSEMBLY TEST AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K01998, Sanders & Thomas, Inc., August,1971
APPOLLO TELESCOPE MOUNT CLEAN ROOM TITLE PAGE
Sheet 1 of 40

8BR1693-55 Photocopy of drawing
OPERATIONS & CHECKOUT BUILDING ASSEMBLY TEST AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K01998, Sanders & Thomas, Inc., August, 1971
ATM CLEAN ROOM GROUND FLOOR PLAN ROOM FINISH SCHEDULE
Sheet 4 of 40

8BR1693-56 Photocopy of drawing
OPERATIONS & CHECKOUT BUILDING ASSEMBLY TEST AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K01998, Sanders & Thomas, Inc., August, 1971
ATM CLEAN ROOM WORKING LEVEL FLOOR PLAN
Sheet 5 of 40

8BR1693-57 Photocopy of drawing
OPERATIONS & CHECKOUT BUILDING ASSEMBLY TEST AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K01998, Sanders & Thomas, Inc., August, 1971
ATM CLEAN ROOM ROOF PLAN MECHANICAL EQUIPMENT ROOM SECOND AND THIRD LEVELS
Sheet 6 of 40

8BR1693-58 Photocopy of drawing
OPERATIONS & CHECKOUT BUILDING ASSEMBLY TEST AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K01998, Sanders & Thomas, Inc., August, 1971
ATM CLEAN ROOM NORTH AND WEST ELEVATIONS
Sheet 7 of 40

8BR1693-59 Photocopy of drawing
OPERATIONS & CHECKOUT BUILDING ASSEMBLY TEST AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K01998, Sanders & Thomas, Inc., August, 1971
ATM CLEAN ROOM SOUTH AND EAST ELEVATIONS
Sheet 8 of 40

8BR1693-60 Photocopy of drawing
CARGO INTERGRATION TEST EQUIPMENT
O & C BLDG, KSC INDUSTRIAL AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K09479, Planning Research Corporation, January, 1978
ISOMETRIC VIEW CARGO INTERGRATION TEST EQUIPMENT
O & C BLDG KSC INDUSTRIAL AREA
Sheet 1

8BR1693-61 Photocopy of drawing
CARGO INTERGRATION TEST EQUIPMENT
O & C BLDG, KSC INDUSTRIAL AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K09479, Planning Research Corporation, January, 1978
CARGO INTERGRATION TEST EQUIPMENT
O & C HIGH & LOW BAY AREAS PLANS AND SECTION
Sheet 3

8BR1693-62 Photocopy of drawing
CARGO INTERGRATION TEST EQUIPMENT
O & C BLDG, KSC INDUSTRIAL AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K09479, Planning Research Corporation, January, 1978
CARGO INTERGRATION TEST EQUIPMENT
INSTALLATIONS ENVELOPE CONTROL PLAN AND SECTIONS
Sheet 4

8BR1693-63 Photocopy of drawing
CARGO INTERGRATION TEST EQUIPMENT
O & C BLDG, KSC INDUSTRIAL AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K09479, Planning Research Corporation, January, 1978
CARGO INTERGRATION TEST EQUIPMENT
MID BODY STRUCTURE FRAMING PLAN & ELEVATION
Sheet 5

8BR1693-64 Photocopy of drawing
CARGO INTERGRATION TEST EQUIPMENT
O & C BLDG, KSC INDUSTRIAL AREA
NASA, John F. Kennedy Space Center, Florida
Drawing 79K09479, Planning Research Corporation, January, 1978
CARGO INTERGRATION TEST EQUIPMENT
MID BODY FRAMING SECTIONS AND DETAILS
Sheet 6